July 30, 2010

Lewistown Drilling Activity Forecast (20 year lifespan)

Source: Montana State Office, Branch of Fluid Minerals, July 2010
Projected Oil and Gas Drilling Activity

General Assumptions:

The Lewistown Field Office (FO) Planning Area contains approximately 13,135,718 surface acres (based on GIS) of all mineral ownership types, Federal, Private, and State (see Fig. 1). Total Federal oil and gas mineral ownership, in the Lewistown FO Planning Area, amounts to about 3,426,577 acres, or about 26 percent of total acres. All Bureau managed oil and gas mineral lands will be covered by decisions made in the Lewistown FO Resource Management Plan Environmental Impact Statement (EIS). The boundaries of the Lewistown FO encompass nine (9) counties: Cascade, Choteau, Fergus, Judith Basin, Lewis and Clark, Meagher, Petroleum, Pondera, and Teton Counties. Two of these counties are only partially located within the boundaries of the Lewistown FO. Those lands located in Lewis and Clark County that lie north of the Township 15 North, and those lands in Choteau County that lie south of the Missouri River are located within the Lewistown FO. Please refer to Table 1 for a breakdown of the associates acreages for these counties and acreages with Federal minerals, along with the associated acreages by county for lands managed by other federal agencies. Also included are the number of authorized leases in effect with their corresponding acreages by county and the remaining unleased lands within those counties.

County	Total Federal Mineral Acres	Total Federal Surface By SMA				No. of Authorized Leases In Effect	No. of Authorized Leased Acres In Effect	Remaining Unleased Federal Minerals
		BLM	BOR	USFS	NWR			
Pondera	177,119	1,358	0	106,831	1,020	61	66,816	110,303
Petroleum	264,668	331,627	0	0	55,563	103	72,576	192,092
Teton	365,996	17,489	23,112	230,506	1,293	8	2,709	363,287
Fergus	702,503	348,228	0	94,232	49,687	52	33,720	668,783
Cascade	242,776	24,757	1,343	179,005	7,090	0	0	242,776
Judith Basin	326,305	12,256	0	298,888	0	0	0	326,305
Lewis and Clark	739,636	9,381	5,112	669,957	0	2	199	739,437
Meaghar	481,241	8,641	0	473,436	0	13	21,034	460,207
Choteau	126,333	66,000	0	30,741	1,200	4	4,016	122,317
TOTALS	3,426,577	819,737	29,567	2,083,596	115,853	243	201,070	3,225,507

Table 1 - Surface, oil and gas mineral ownership, and acres of oil and gas leases by county.

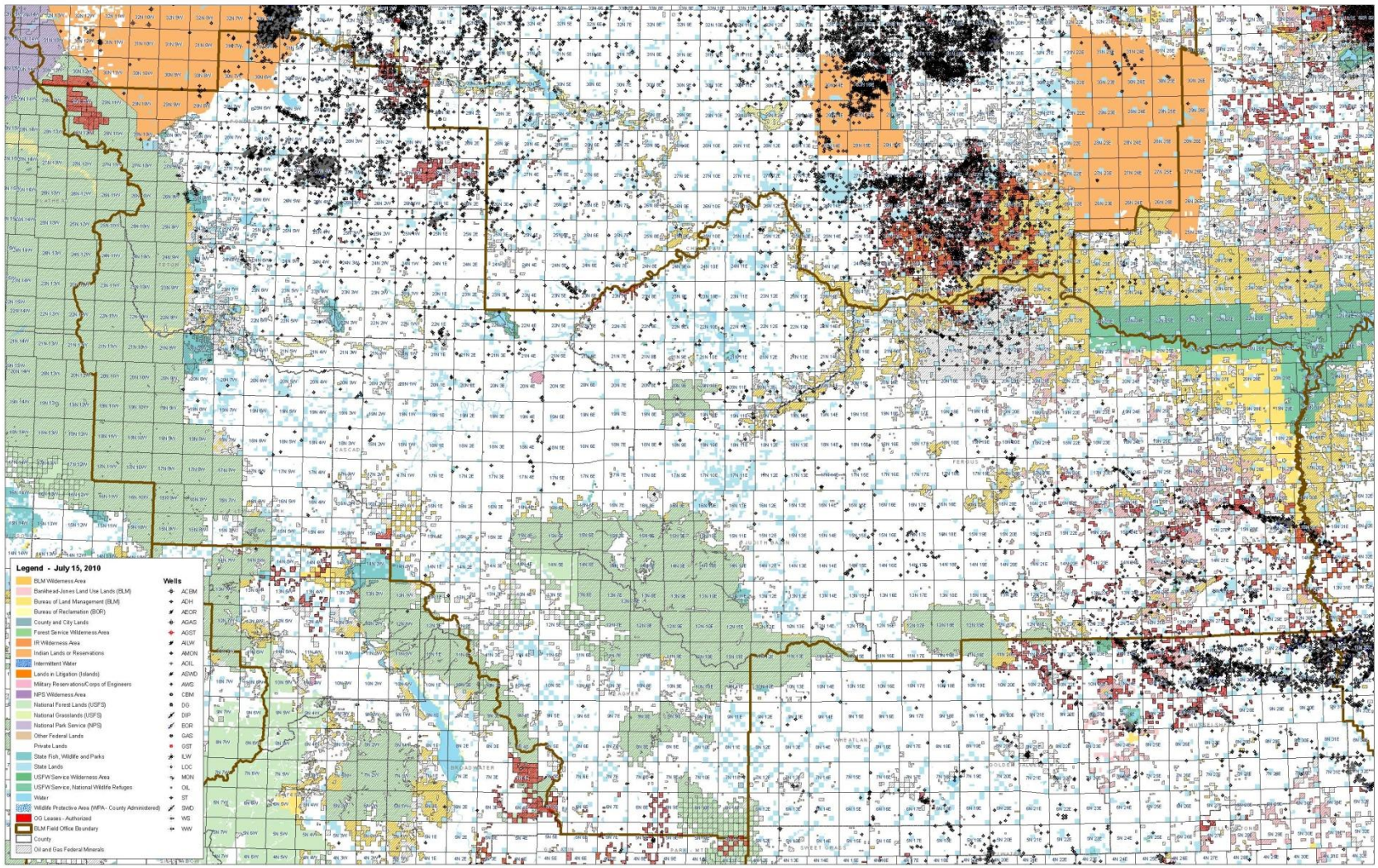

Figure 1 - Map of the Lewistown Field Office (Study Area) depicting surface and mineral ownership, and status of all wells.

Oil and Gas Resources:

A petroleum system exists wherever certain essential geologic elements and processes occur together in time and place. The essential geologic elements of a petroleum system include the presence of a source rock, reservoir rock, seal rock, and overburden rock. Formation of the trap, and the generation, migration, and entrapment of hydrocarbons are the two processes involved with a petroleum system. These essential geologic elements and processes must be correctly placed in time and space so that organic matter in a source rock can be converted into a petroleum, which then migrates and accumulates into a hydrocarbon trap (Magoon and Beaumont, 1999). The absence of any essential geologic element or process prevents the accumulation of hydrocarbons into a trap.

There are effective petroleum systems present within the study area, as evidenced the presence oil and gas fields in Pondera, Petroleum, Teton, Fergus, and Cascade counties.

Total Wells Drilled Per Year: It is assumed that future drilling rates and the number of successful wells during the 20-year planning period will be similar to what has occurred during the past 20 years.

Based upon the BLM's AFMSS well database, IHS Energy's well database, and the Montana Board of Oil and Gas well database, there are approximately 3,600 wells drilled within the study area. Figure 2 is a graph illustrating the total number of wells drilled within the jurisdiction of the Lewistown Field Office by decade. It is interesting to note the high level of activity during the 1920's, and from most of the 1950's through the 1990's. However, during the past couple of decades the study area has received relatively little interest from the oil industry compared to prior decades, when more than 50 wells were drilled per year during some years.

Figure 3 is a graph illustrating the total number of wells drilled within the jurisdiction of the Lewistown Field Office since 1986.

Based upon historical drilling during the past 20 years, it is anticipated that between 0 and 35 wells will be drilled per year during the 20-year planning period, with a most-likely estimate of about 12 wells drilled per year (see Fig. 3). It is further estimated that out of the average 12 wells expected to be drilled per year, 0-2 wells will be drilled on Federal mineral lands and 0-10 wells will be drilled per year on Private and State mineral lands.

It is possible that more or less wells will be drilled in the future during the 20-year planning period than anticipated in this document if events occur that are unforeseen, unexpected, or impossible to predict at this time. Such unanticipated events may include new technological advancements, large changes in oil and gas prices, large changes in global energy supply and demand patterns, and other global events such as war, oil embargos, etc.

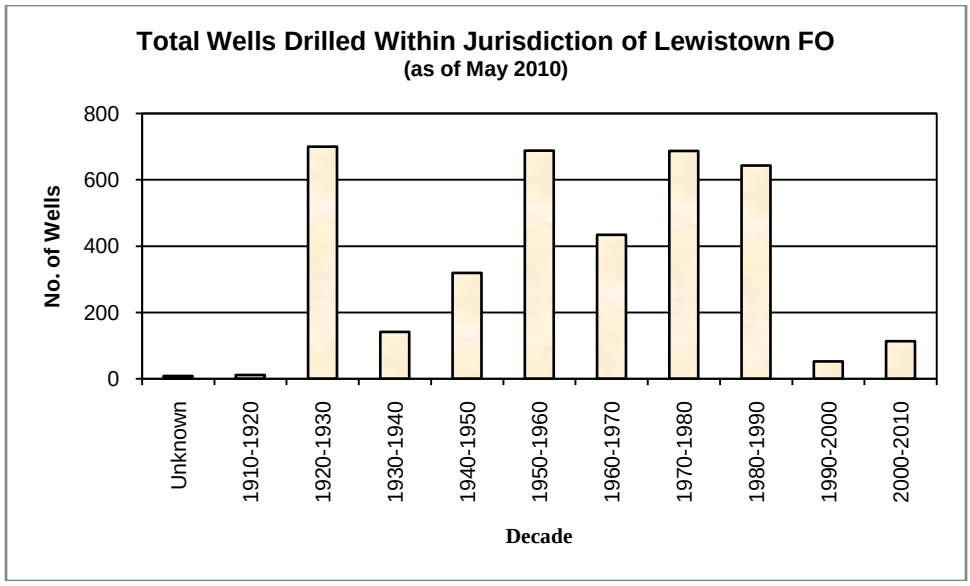

Figure 2 - Total wells drilled within the study area by decade.

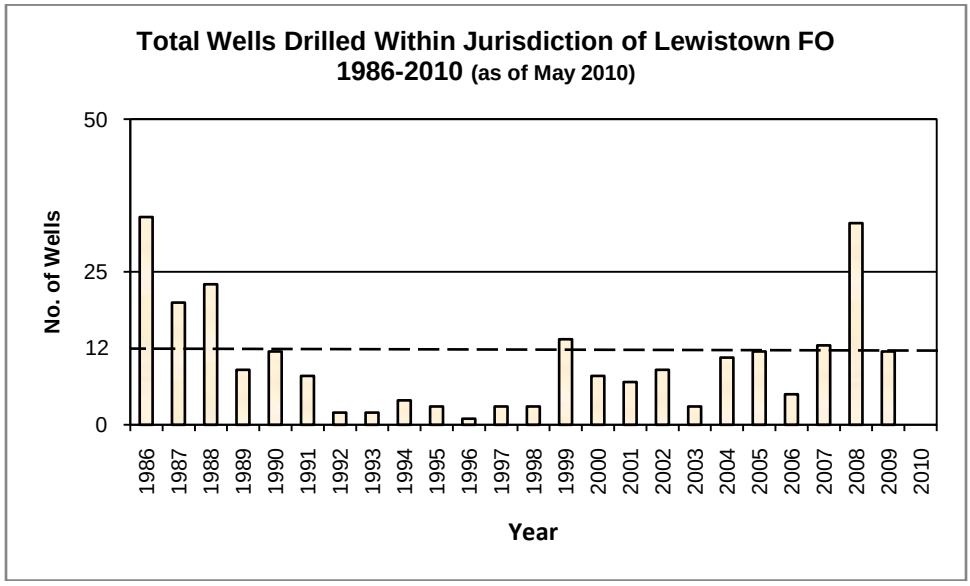

Figure 3 - Total wells drilled within the study area by year 1996 through May 2010.

Out of the approximately 3,600 wells drilled within the study area, about 12% of the wells were drilled on Federal mineral lands and about 88% of the wells were drilled on Private/State mineral lands. It is anticipated that future wells drilled within the study area will be respectively drilled on Federal and Private/State mineral lands in the same relative percentages as in the past.

There are approximately 472 wells within the study that are producing either oil or gas. Approximately 74% of all producing wells are oil wells and 26% are gas wells. About 9% of all producing oil wells are located on Federal mineral lands and about 7 percent of all producing gas wells are located on Federal mineral lands. It is anticipated that future productive wells drilled on Federal mineral lands within the study area will respectively produce oil and gas in the same

relative percentages as in the past. The success rate for a well drilled on either Federal or Private and State (non-Federal) mineral lands is assumed to be approximately 30%.

The formula used to estimate the number of producing oil wells drilled per year on Federal mineral lands within the study area during the 20-year planning period is as follows:

= Estimated number of wells drilled per year x success rate x % POW x % Federal POW
= 12 x 30% x 74% x 9%
= 0.24 Federal producing oil wells drilled per year

The formula used to estimate the number of producing gas wells drilled/year on Federal mineral lands within the study area during the 20-year planning period is as follows:

= 12 x 30% x 26% x 7%
= 0.07 Federal producing gas wells drilled per year

The formula used to estimate the number of producing oil wells drilled per year on Private and State mineral lands within the study area during the 20-year planning period is as follows:

= Estimated number of wells drilled per year x success rate x % POW x % Private and State POW
= 12 x 30% x 74% x 91%
= 2.42 Private and State producing oil wells drilled per year

The formula used to estimate the number of producing gas wells drilled per year on Private and State mineral lands within the study area during the 20-year planning period is as follows:

= Estimated number of wells drilled per year x success rate x % PGW x % Private and State PGW
= 12 x 30% x 26% x 93%
= 0.88 Private and State producing gas wells drilled per year

Thus, during the 20-year planning period, it is estimated that approximately 4 to 5 producing oil wells and 1 to 2 producing gas wells will be drilled on Federal lands within the planning area (estimates are rounded whole numbers).

It is further estimated that, during the 20-year planning period, approximately 48 to 49 producing oil wells and 17 to 18 producing gas wells will be drilled on Private and State lands within the planning area (estimates are rounded whole numbers).

Table 2 shows the approximate number of Federal, Private, and State wells (non-Federal) drilled within the study area and identified by well type in each county.

	Pondera		Petroleum		Teton		Fergus		Cascade		Judith Basin		Lewis and Clark		Meagher		Choteau		Totals:	
	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.	Fed.	Non-Fed.
POW	14	210	17	36	0	102	0	0	0	0	0	0	0	0	0	0	0	0	31	348
PGW	4	111	0	0	0	8	5	5	0	0	0	0	0	0	0	0	0	0	9	124
OSI	11	206	4	34	0	80	0	0	0	0	0	0	0	0	0	0	0	0	15	320
GSI	2	32	0	0	1	13	0	5	0	0	0	0	0	0	0	0	0	1	3	51
WIW	0	26	5	10	0	9	0	0	0	0	0	0	0	0	0	0	0	0	5	45
WSW	0	2	2	27	0	2	0	24	0	17	0	7	0	1	0	4	0	15	2	99
P&A	16	871	188	571	32	523	113	335	7	83	1	52	0	23	0	6	0	91	357	2,555
TA	20	32	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	20	35
WDW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total:	67	1,490	217	680	33	738	118	369	7	100	1	59	0	24	0	10	0	107	443	3,577

Table 2 - Table showing approximate number of Federal and non-Federal wells by well type in each county comprising the Lewistown Field Office.

Separate graphs (Figures 4 through 12) were also compiled to illustrate the historical level of drilling activity in each county comprising the study area. The counties with the higher level of drilling activity, such as Pondera County, the northern part of Teton County, and the southern part of Petroleum County, have been identified by the oil and gas industry as being geologically more prospective to contain commercial quantities of hydrocarbons than those counties which have received relatively little drilling interest.

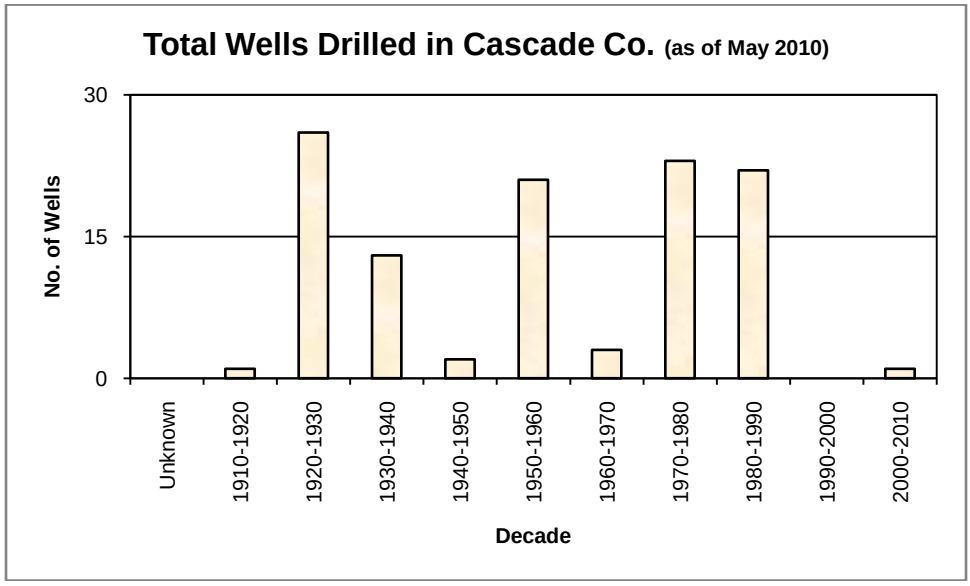

Figure 4 - Total wells drilled within Cascade County by decade.

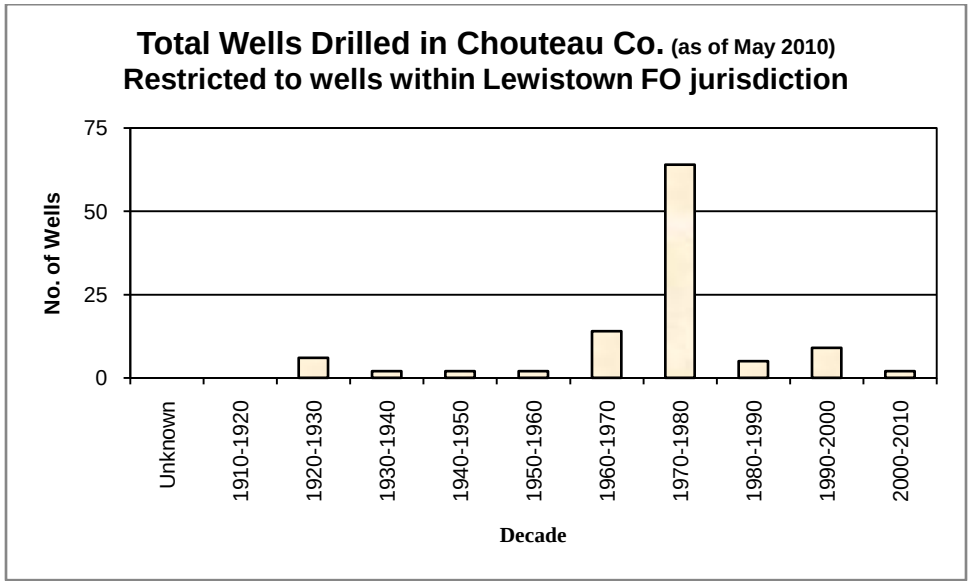

Figure 5 - Total wells drilled within that part of Chouteau County administered by the Lewiston Field Office by decade.

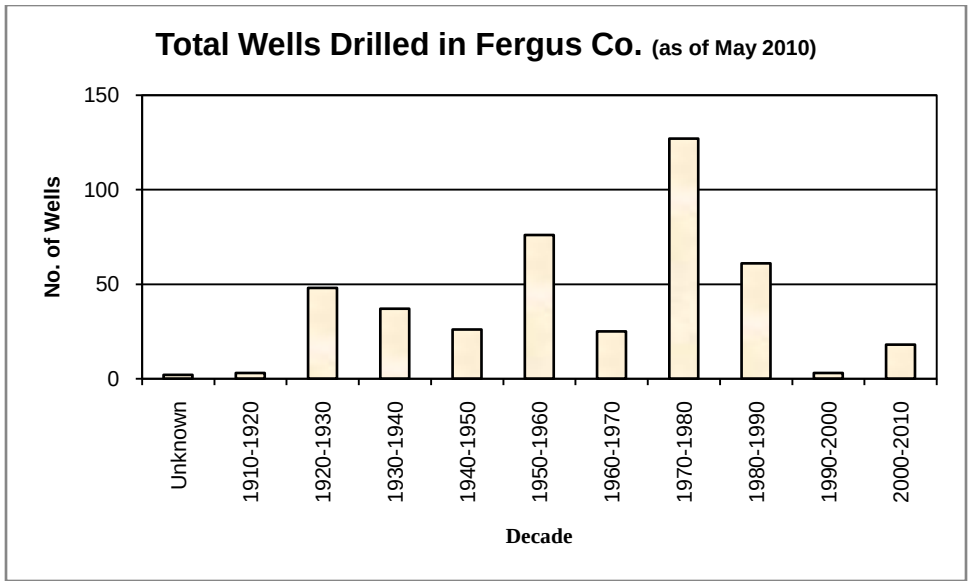

Figure 6 - Total wells drilled within Fergus County by decade.

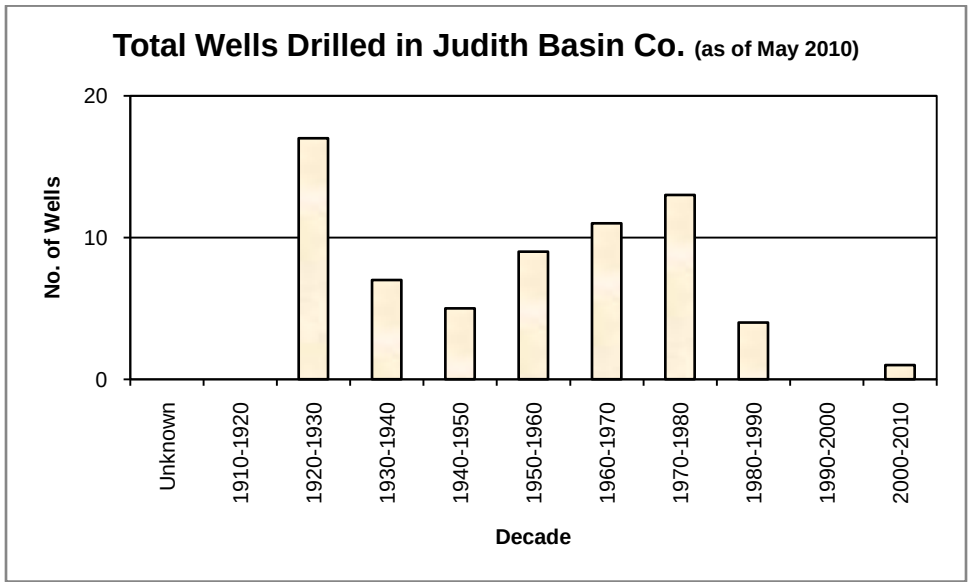

Figure 7 - Total wells drilled within Judith Basin County by decade.

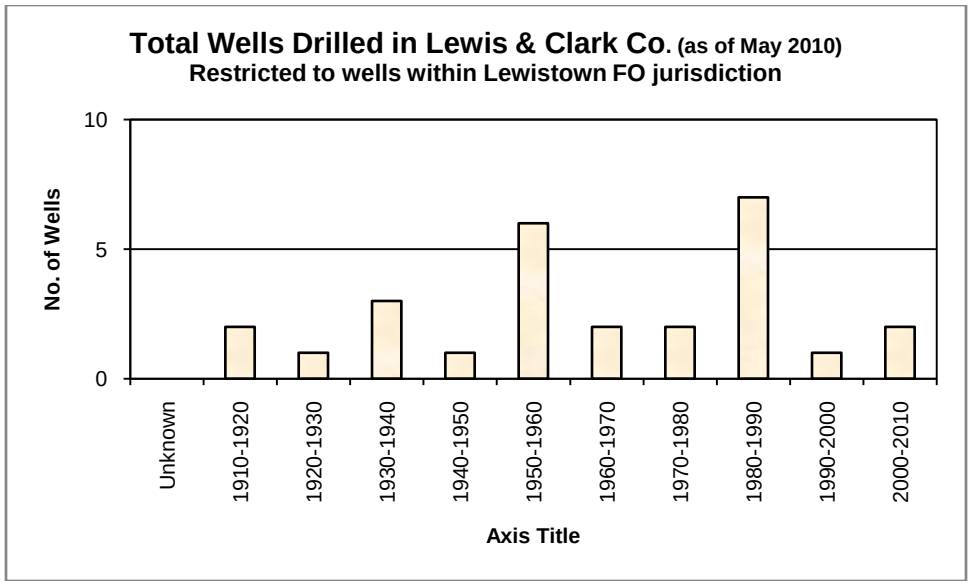

Figure 8 - Total wells drilled within that part of Lewis and Clark County administered by the Lewiston Field Office by decade.

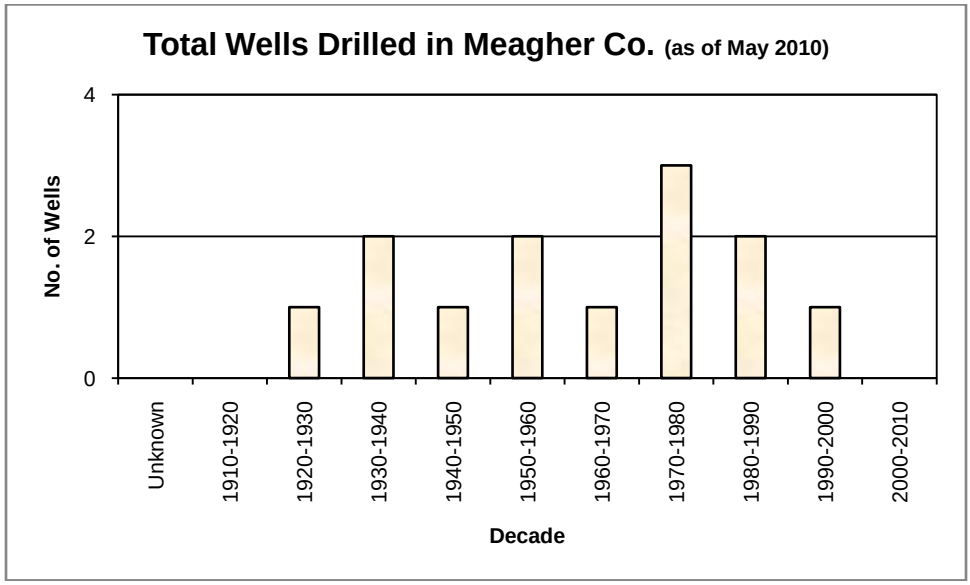

Figure 9 - Total wells drilled within Meagher County by decade.

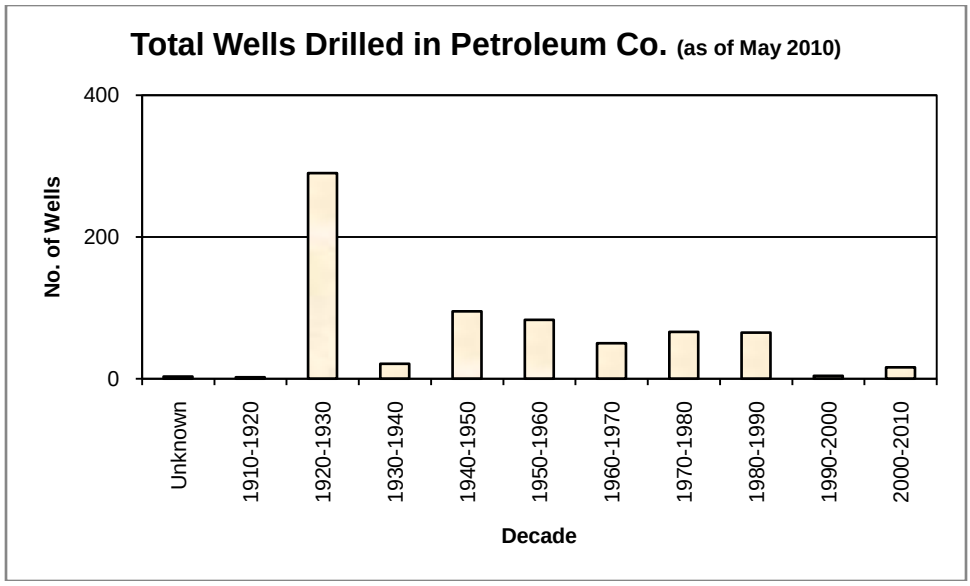

Figure 10 - Total wells drilled within Petroleum County by decade.

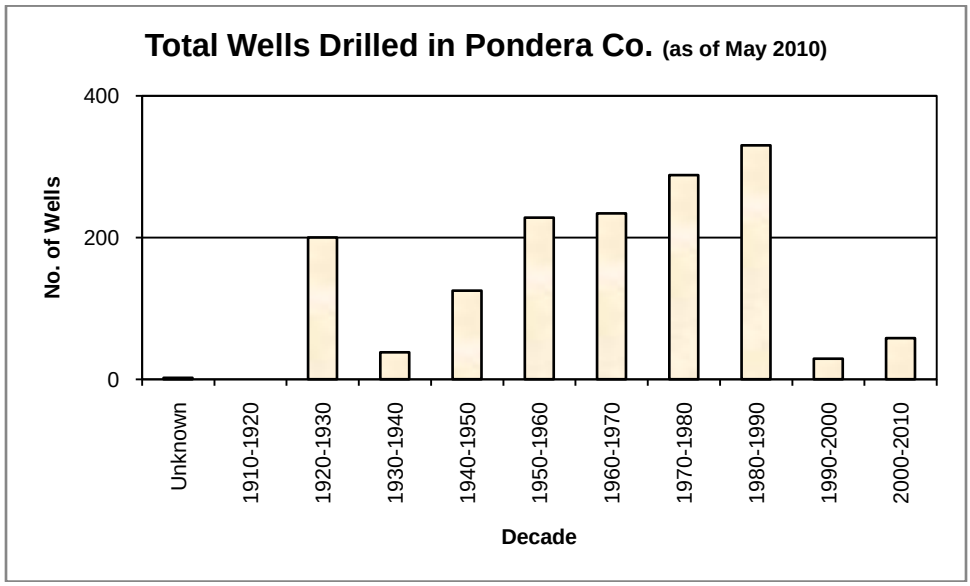

Figure 11 - Total wells drilled within Pondera County by decade.

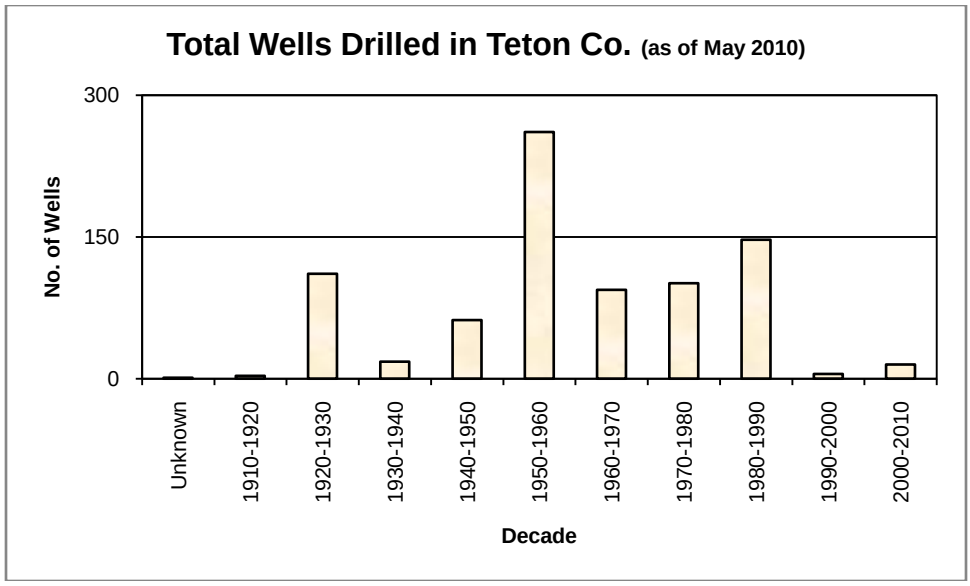

Figure 12 - Total wells drilled within Teton County by decade.

Well Depths:

Only about six wells have been drilled within the study area to a depth greater than 10,000 feet, with the deepest well being drilled to a depth of 13,225 feet. The average depth of the wells drilled within the study area is approximately 2,300 feet. As indicated in Figure 13, which shows the depths of the wells drilled within the study area, a majority of the wells have been drilled to a depth between 1,000 feet and 4,000 feet. It is anticipated that most wells drilled during the 20-year planning period will be drilled to a depth between 1,000 feet and 4,000 feet.

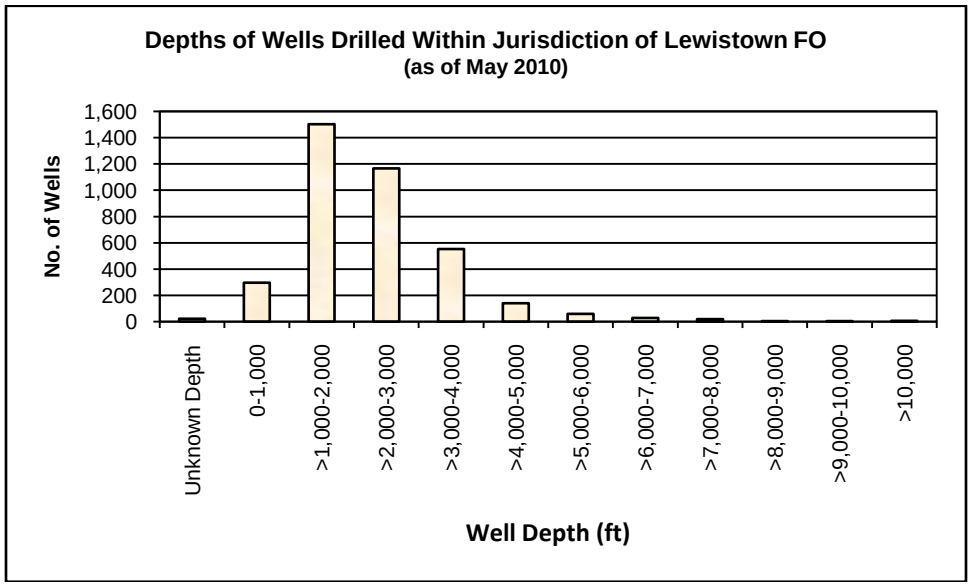

Figure 13 - Depths of wells drilled within the study area.

Most of the wells drilled within the study area are vertical, and most future wells are also anticipated to be vertical. It is possible that some future wells will be horizontally drilled to

minimize surface environmental impacts, comply with restrictions on surface occupancy, or to recover hydrocarbons that would not otherwise be economically feasible to recover with a vertical well. Approximately 74% of the currently producing wells are oil wells, and it is expected that most wells drilled during the 20-year planning period will be oil wells.

Compressors/Pipelines

Most of the production in the Lewistown Field Office is located in the northwestern part of the Field Office administrative area in Pondera and Teton Counties (oil and gas), directly south of the Little Missouri River in Choteau County (mostly gas), and in Petroleum County (oil and gas). Table 3 identifies the oil and gas fields located in those counties. In addition, since gas compressors are a necessity in those areas producing gas in order to get the gas to market, Table 4 identifies the locations of those gas compressors. The BLM's records indicate no gas compressors are currently operating on Federal lands in the following counties: Chouteau, Meagher, Lewis and Clark, Judith Basin, Cascade, Fergus, and Petroleum.

At this time, the BLM does not envision any additional placement of gas compressors in these areas based on the BLM's projected development and because the current infrastructure is expected to handle the current and future demand. Any change to the current infrastructure will only occur if a major gas discovery is made in areas not currently producing gas.

In regards to oil production, oil production is currently contained on existing tank batteries at each location and transported by truck to local markets. No major oil pipelines are anticipated in these areas at this time unless a major oil discovery is made in an unforeseen new resource play.

Pondera	Petroleum	Teton	Fergus	Cascade	Judith Basin	Lewis and Clark	Meaghar	Choteau
Brady	Brush Creek	Agawam	Armells	Otter Creek	N/A	N/A	N/A	N/A
Broken Arrow	Cat Creek	Bannatyne	Leroy					
Conrad, South	Cat Creek, Mosby Dome	Bills Coulee	Spindletop					
Crocker Springs, East	Cat Creek, West Dome	Blackleaf Canyon						
Cutbank	Kootenai	Gypsy Basin						
Dry Fork	McDonald Creek	Highview						
Fort Conrad	Oiltana	Pondera						
Gypsy Basin	Rattlesnake Butte	Pondera Coulee						
Gypsy Basin, North		Runaway						
Hardpan		Second Guess						
Highview								
Lake Francis								
Ledger								
Marias River								
Marias River, South								
Meander								
Midway								
Pondera								
Pondera Coulee								
Valier								
Williams								
Wishbone								

Table 3 - Oil and gas fields by county in the Lewistown Field Office area.

Operator	Size (HP)	QtrQtr	Sec.	Twp.	Rng.	County	Gas Field
Balko, Inc.	400	NESE	14	29N	2W	Pondera	Ledger
Genesis Energy	204	SENW	36	29N	5W	Pondera	Lake Francis
Genesis Energy	360	SENW	36	29N	4W	Pondera	Shelby Williams
Genesis Energy	86	?	?	?	?	Pondera	Lake Francis
Montana Star Pipeline	195	SENW	24	29N	5W	Pondera	Lake Francis
Ranck	100	?	?	?	?	Pondera	Fort Conrad
Sleepy Hollow	203	?	29	19N	19E	Fergus	?
Sleepy Hollow	203	?	29	15N	18E	Fergus	?

Table 4 – Current gas compressors by legal description in the Lewistown Field Office area.

Oil and Gas Production

Based on the historical production for gas wells in the study area, the BLM has estimated that a typical gas well capable of production in these areas would ultimately produce approximately 400,000 MCF (0.4 BCF) of gas. At this time, it appears there has recently developed some interest by the industry in exploration in Petroleum County with the Mississippian-age Heath Formation and in Fergus County with the Eagle and Colorado Shale as the primary reservoir objectives. As of July 19, 2010, the Montana Board of Oil and Gas Conservation (MBOGC) has received and approved three (3) drilling permits (oil) (Central Montana Resources, LLC) to test the Heath Formation in Petroleum County, and nine (9) drilling permits (gas) (Kykuit Resources, LLC) to test the Eagle and Colorado Shale Formation in Fergus County. However, there has been no new Application for Permit (APD) recently filed on federal lands. With the varying mineral ownership within this area, it is likely that an APD may eventually be filed on federal lands within this area to evaluate these potentially emerging plays.

References Cited:

Magoon, L.B., and Beaumont E.A., 1999, Petroleum Systems [*in*] Exploring for Oil and Gas Traps, E. A Baumont and N.H. Forster (eds.): Am. Assoc. Petrol. Geologists Treatise of Petroleum Geology, Handbook of Petroleum Geology , p. 3-1 to 3-34.